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Ocular Disorders among Students Attending Special Education Schools in Gurugram (India), who have Learning Difficulties with Learning

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Abstract - The purpose of this research was to investigate and treat ocular disorders in children with learning disabilities (cLDs), as well as investigate possible associations between these conditions and the children's perinatal histories.In 2019, children with learning disabilities (cLDs) who were enrolled in 11 different special schools were evaluated by a group that included an ophthalmologist, an optometrist, and a social worker. The students' medical histories as well as their intelligence quotient (IQ) were taken into consideration. A comprehensive ocular examination was carried out, during which the patient's distant visual acuity was evaluated using either Snellen's tumbling E chart or Kay pictures. When it was determined that it was necessary to do so, students were evaluated at the paediatric ophthalmology unit as well as the low vision centre. The Chi-square test was utilised for the statistical analysis of the ordinal data that was compiled using SPSS.

There were a total of 664 students who were evaluated, 526 of whom were younger than 16 years old, and 323 of whom were male (61.4%). The average intelligence score was 45.4, and the number of people with moderate-to-severe learning disabilities ranged from 326 (60 percent). 143 (27.3 percent) of the children had an uncorrected refractive error, followed by strabismus in 83 (15.8 percent), nystagmus in 36 (6.8 percent), optic atrophy in 34 (6.5 percent), and congenital anomalies in 13 (2.5 percent). One hundred and three children had more than one abnormality. Among the 143 students who needed glasses for their vision, only 12 were actually wearing them. Ocular difficulties were present in a total of 132 (48.7 percent) of the children who had a history of perinatal insult. Those with a family history of epilepsy, Down syndrome, or cerebral palsy were also more likely to suffer from ocular disorders.In this particular study, nearly half of the cLDs were found to have ocular disorders, but the vision of one quarter of them was improved.

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INTRODUCTION

Vision is an essential component in the development of a wide variety of skills, including the ability to read facial expressions, communicate verbally, and perform tasks that require hand–eye coordination. When a child is older than 10–12 years old and still has an uncorrected distance visual deficit, the child's visual system loses its capacity for plasticity, and the child's ability to recover their vision may be severely impaired. Children who lack adequate vision face limitations in every aspect of their lives, and untreated vision disorders interfere with their capacity to make well-informed decisions and acquire knowledge from their surroundings.

Several studies have investigated the prevalence of ocular and visual disorders in adults with intellectual disabilities. The prevalence of visual impairment increased with age and the severity of intellectual disability in the Netherlands, where 72.3-92 percent of adults with intellectual disability had an ocular problem, depending on the severity of the intellectual disability. On the other hand, evaluating children with learning disabilities (cLDs, formerly known as mentally challenged or retarded) is difficult because it requires more patience, expertise, and a wider variety of assessment instruments than evaluating normal children. There have only been two studies conducted on cLDs in India that demonstrate the prevalence of ophthalmic conditions such as refractive errors, strabismus, and nystagmus. According to estimates provided by the World Health Organization (WHO), the prevalence of mental retardation in the general population (across all ages) is 2%, while this figure rises to 3% in individuals who are younger than 18 years old. In spite of the magnitude of the issue, those who are negatively impacted are not receiving adequate care because even medical professionals are unaware of the nature and scope of their challenges.

The cumulative impact of an individual's multiple impairments, rather than simply adding up, can have a multiplicative rather than an additive effect on the person's quality of life.

A difficult pregnancy and delivery can increase the risk of a child developing a variety of medical conditions, one of which is eye problems. The purpose of this study was to investigate the range, type, and frequency of ocular and visual disorders among children (students under the age of 16 years, as defined by WHO) with learning disabilities who attended special education schools in a city located in the state of Maharashtra in India. Additionally, research was conducted to examine the correlation between ocular disorders and perinatal history. After a year, the effects of treating all treatable disorders were analysed, and all of the disorders were addressed wherever it was possible to do so.

MATERIAL AND METHODOLOGY

A letter was sent to the principals of all special education schools in Gurugram city for children with learning disabilities proposing that all students in their school be examined in order to diagnose and treat eye disorders. The letter was addressed to children with learning disabilities. The hospital's ethical committee gave their stamp of approval to the research project. The team of ophthalmologists (senior and resident), optometrists, and a social worker examined all of the students in the special school between the months of January and July 2018, and then followed up with them between the months of July and August 2019.

The school made sure to let the parents know about our upcoming visit well in advance, and they were asked to be present during the examination of their child. The process of the examination was walked through with the teachers, after which their assistance was solicited. Teachers and parents were asked to inform the examination team if they had observed any of the following symptoms in their students or children: the child holds his or her work very close or sits close to the blackboard; a squint; drooping eyelids; red eyes; habitual eye rubbing or poking; white spots in the eyes; a history of night blindness; had spectacles that had been prescribed previously; or any other eye health problem.

Every child is required to go through a time-consuming certification process before being accepted into the schools, and the schools keep copies of the children's certification reports on file. These records were looked over for every child in order to ascertain the following information:

(a) the history of the family, including whether or not the disease ran in the family and, if so, who else in the family was affected and whether or not there was a history of consanguinity;

(b) the level of antenatal care that the mother received, which was categorised as poor (i.e., there was no antenatal visit), fair (i.e., there was one antenatal visit), or good (i.e., there was more than one antenatal visit);

(c) the specifics of the birth, such as whether the birth was preterm, term, or postterm, as well as the mode of delivery (normal, vaginal (instrument assisted), or by Caesar

(d) significant medical events, such as epileptic seizures, jaundice, the requirement of an incubator, cyanosis, fever, meningitis, or a head injury; and

(e) known systemic disorders, such as Down syndrome, epilepsy, cerebral palsy, and attention deficit disorder.

An intelligence quotient (IQ) test had been performed in the past at the government medical college, which served as the official certifying authority. The test had been conducted using the Binet–Kamat method. Before beginning the examination, members of the team were strongly encouraged to spend some time getting to know the child and building a rapport with them.

The examination of the patient's external eye was performed with the aid of a flashlight in diffuse lighting. It was observed that the patient had an abnormal head posture, facial anomalies, and ocular motility. After performing an orthoptic examination utilising Hirschberg's reflex, follow-up cover/uncover tests were carried out if the reflex was found to be abnormal. The visual acuity of more severely disabled children and younger children was evaluated using the Kay picture test. Children whose learning disabilities were not as severe were tested using the Snellen chart, either in English, Marathi (the regional language), or numbers. The "E" chart developed by Snellen was utilised for children who did not know how to read but were able to understand symbols.

Subjective correction was attempted on all children who had visual acuity less than 20/30 in either eye. Cycloplegia was only undertaken for children in whom retinoscopy revealed hypermetropia and all children with esotropia or esophoria using cyclopentolate eye drops (0.3 percent) after ascertaining that the child did not have seizures or behavioural disorders. In such cases, tropicamide (1 percent) eye-drops were used. If subjective refraction was not possible, the prescription was based on the retinoscopy findings. Glasses were prescribed for all children who required a myopic correction of ≥–1.0 diopter (D), hypermetropic correction of ≥+3.0 D, and/or astigmatism of ≥0.5 D cylinder (C) (C). Children with a visual acuity <20/40 in either eye underwent dilated fundus examination with a direct ophthalmoscope. Teachers were warned about possible complaints of temporary near vision impairment and of glare. Children whose

visual acuity did not improve to 20/200 in the better eye were classified as severely visually impaired and those whose vision did not improve to 20/60 were termed visually impaired. The cause of impairment was identified, if more than one cause of impairment was present, the avoidable one was considered. Medical care was administered to the children who exhibited symptoms of vitamin A deficiency, including ocular surface infections and hordeolae. Within a month, each child received a pair of eyeglasses that corrected their vision. Children whose vision did not improve beyond a level of 20/200 were referred to the paediatric ophthalmology department of the hospital. This department treats children who require specialised attention.

At the medical facility, the child's visual acuity was evaluated using a number of techniques, such as Cambridge cards, Cardiff cards, and Lea picture charts, depending on how the child responded to the examination. All of the children who had either a manifest or a latent ocular deviation had their stereopsis evaluated. An examination with a slit lamp, either hand-held or chair-mounted, was performed on every child by a paediatric ophthalmologist. After having the pupils dilated, an indirect ophthalmoscopic examination was performed on the children who were thought to have a problem with their retina. A specialist evaluated the requirement for low-vision devices by using magnifiers that were either stand-mounted, hand-held, or attached to spectacles. The significance of altering one's environment, particularly with regard to differences in colour and contrast, was discussed with the parents.

Following an intervention, such as the distribution of glasses, the performance of surgery, or the provision of low-vision aids, all of the children were reevaluated one year later using the same protocol.

RESULTS

A total of 664 students from 11 different special schools were evaluated for this study. This study presents data from 526 children with learning disabilities (cLDs) who were younger than 16 years old; 323 of these children were male (61.4%). The average age was 12.1 years, 114 (21.7 percent) of the participants were younger than 10 years old, and 62 of them were known to have a learning disability or cognitive impairment in their families. Table 1 shows the distribution of IQ scores; the mean IQ was 45.4, and the range of possible IQ scores was 19–80.

Table 1: Distribution of intelligence quotient category in children examined intelligence quotient

	Category of Mental Retardation	**Number**	**%**
< 20	Profound	0	0
20-35	Severe	50	9.5
35-50	Moderate	276	52.5
50-70	Mild	146	27.8
70-85	Borderline Intellectual Function	6	1.1
85-100	Normal	0	0
Unknown	-	48	9.1
Total		526	100

238 (or 45 percent) of the 526 children who were examined had an ocular disorder, and 103 (or 26 percent) of those children had more than one ocular disorder [Fig. 1]. Testing of the children's visual acuity was successful in all but 15 of them. The comprehensive clinical evaluation was performed on each and every one of these 15 children.

A total of 210 out of the 526 children aged 16 years underwent a cycloplegic refraction; 143 (26.8 percent) had refractive errors, including 57 (10.5 percent) that were myopic, 56 (10.6 percent) that were hypermetropic, and 30 (5.7 percent) that had astigmatism. Refractive errors were significantly more common in children who had lower IQs (Pearson's R, P = 0.037). This correlation between IQ and the prevalence of refractive errors was found to be significant. Only 12 (8.3 percent) of the 143 children diagnosed with refractive errors were actually wearing glasses, and only 25 (17 percent) of the children with refractive errors had ever had their vision corrected.

Among the 83 children with strabismus, 15.7 percent, 45 (54.2 percent) had exotropia, 38 (45.7 percent) had esotropia, and 33 children (39.7 percent) had angles that were greater than 30 degrees. Only 43 out of the 83 children had an associated refractive error, which is a percentage of 51.8. There were 19 children diagnosed with hypermetropia, 19 diagnosed with myopia, and 5 diagnosed with astigmatism who had strabismus. Cranial nerve palsies were found to be the cause of strabismus in seven different children. It was reported by the parents of children who had strabismus that their children had a difficult time finding social acceptance because of the deviation. According to the results of an independent t-test, the mean IQ of children who had strabismus was 43, which was lower than the IQ of children who did not have the condition, which was 46.

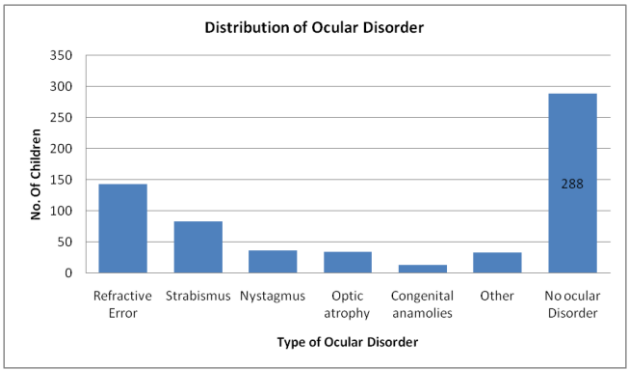

Figure 1: Distribution of ocular disorder in children with learning disability

Optic atrophy was found in 34 of the children, which represents a prevalence rate of 6.5 percent. The condition was found more frequently in children with cerebral palsy (9/25, or 36 percent).

According to the two-by-two Chi-square test, the probability that a child will have an ocular morbidity is 41.9% if they have a known history of perinatal insult and 46.5%

if they do not have a known history of perinatal insult. Of the 353 children who had a known history of perinatal insult, 164 (46.5 percent) had an ocular morbidity.

Table 2: Distribution of ocular disorder in children with history of prenatal insult

Perinatal insult	Number	Refractive Error	Strabismus	Optic autrophy	Nystagmus	Others	Total
Poor antenatal care	73	13(17.8)	15(20.5)	5(6.8)	10(13.7)	6(8.2)	63
Preterm	68	20(29.4)	11(16.2)	9(13.2)	6(8.8)	8(11.8)	68
Delayed cry at birth	157	24(28.6)	31(19.7)	19(12.1)	16(10.2)	10(6.4)	152
Assisted / Caesarian birth	84	37(35.2)	14(16.7)	8(9.5)	7(8.3)	6(7.1)	73
Low birth weight	105	16(27.1)	15(14.3)	8(7.6)	10(9.5)	7(6.7)	96
Fever/meningitis /head injury	59	10(23.8)	11(18.6)	5(8.5)	1(1.7)	3(5.1)	38
History of incubator use	42	15(46.9)	8(19.0)	5(11.9)	7(16.7)	4(9.5)	43
History of convulsions	32	15(46.9)	10(31.3)	5(15.6)	4(12.5)	2(0.6)	43
History of jaundice	35	10(28.6)	4(11.4)	3(8.6)	3(8.6)	0	24

Thirty children were diagnosed with strabismus, and six of those children underwent surgery. Sixteen children were offered low-vision aids, and eight children were referred for ptosis, pseudophakic posterior capsular opacification, retinal dystrophy, and cornea disease. In total, 54 children were referred to the hospital for further evaluation and treatment. Only 2 of the 11 schools that we went to had ever been visited by an eye care provider, and the most recent one had been 4 years ago.

After one year, 106 out of 143 children who had been refracted and given glasses were available for further examination. This represents a 74.1 percent availability rate. It was reported by the children's teachers that a total of 37 of the students had improved in their academic activities, such as their reading and writing speed, their ability to identify smaller objects, their attention span, and their handwriting. The number of children who had become more socially active was 26. They had improved their skills in navigating on their own and moving around independently. To 37 people, it was recommended that they keep using the same pair of glasses, while 47 were told they required a new pair.

DISCUSSIONS

cLDs were found to be a group that required ophthalmologic evaluation; however, only 12 of the 143 students who possessed refractive errors were wearing corrective lenses. In this study, nearly half of the participants with cLDs (45.3 percent) had ocular disorders, and the vision of one-quarter of them was improved with refraction. Ocular problems were present in 48.7 percent of the children who had a history of perinatal insult. That's just under half.

This was the first study of children with cLDs, and it was also the first study of its kind to use the school screening method, which had previously only been used for "normal" children. The sample size was also sufficient. The study had a higher level of internal validity because we had used the entire population of students under the age of 17 rather than just a sample, and it had a high level of external validity because all of the schools in the Gurugram region had participated in the screening process. The examination of the students was carried out bearing in mind that the children would not respond to assessment tools that were chronologically appropriate for their ages. Instead, it was determined that the children would need to be evaluated using tools designed for younger children, similar to what was done in Nepal.The success of the evaluation was dependent on the cooperation of the teaching staff at the school as well as the development of a positive rapport between the child being evaluated and the person conducting the evaluation. During the testing of the children's visual acuity, it was discovered that all but 15 of the 526 (2.9% of the total) were responsive. It would be ideal if all children with intellectual disabilities were required to visit an ophthalmologist prior to receiving disability certification from the relevant authorities. This would ensure that children with intellectual disabilities receive proper care. Additionally, the study provided us with a platform from which to raise awareness levels among special educators as well as parents.

A lot of parents and people who provide care for children have the misconception that in order to get an eye exam, a person needs to be able to communicate verbally. A child who has intellectual

disabilities usually places a strain on the time, energy, and financial resources of their parents. This is because of the challenges that the child has. In a pragmatic manner, many parents expressed their opinion that they did not see a financially viable future for their child, and as a result, "complicated" examinations were a "waste of time" for them.

According to the findings of this study, the most common type of ocular disorder is known as refractive errors (27.3 percent). According to Bankes' research, nearly half of children with mental disabilities had some kind of refractive error. Research conducted by Warburg found that the prevalence of myopia in severely/profoundly intellectually impaired adults was 43 percent, while the prevalence of hypermetropia was 21 percent. According to the findings of Van den Broek's research, 22 percent of adults with severe and profound multiple disabilities had refractive errors.Refractive errors were found in 34.4 percent of students in a series of intellectually challenged students in Nepal. The most common type of refractive error found in these students was simple hypermetropia. This is in comparison to the 11 percent of normal students who had ocular morbidity. The prevalence of refractive errors was significantly higher than what was discovered in typically developing children in urban and rural India[2021] and among the same population. Because they had never undergone a comprehensive eye exam, a sizeable proportion of the children diagnosed with learning disabilities also suffered from visual impairment.

According to the findings of our research, 46.5% of children with a documented history of perinatal trauma had at least one ocular disorder. This establishes that a child with a history of a stormy perinatal period was more likely, even in the population of cLDs, to have ocular and visual health issues. This was the case regardless of whether or not the child had cLDs. The different types of perinatal trauma that a baby was exposed to resulted in a different distribution of ocular disorders.

This was a study that took a cross-sectional approach, and there was only one compliance check at the end of the one year period. Children who suffered from moderate to severe mental retardation were not adequately represented. The fact that male children made up 61 percent of the sample, which was typical of children who were institutionalised, suggests that there is a possibility of gender bias. The cycloplegic refraction was not performed on every child because it would have taken too much time, and there was a risk that the children would have convulsions if cyclopentolate was used. It should be noted that subjective refraction was performed, which may have led to measurement bias. Children who had a visual acuity of 20/30 or better in each eye without the aid of corrective lenses were exempt from the need for refraction. Because of this, the likelihood of latent hypermetropia being present may have been underestimated. There was no recording of near vision, nor was there any consideration of accommodative lag or reserve. The contrast sensitivity and field of vision of the students at the special education schools were unable to be measured. Because the data were collected at the time the child was admitted to the special education school and were based on the medical records that were carefully preserved by the parents, there is a possibility that the perinatal insult was stated based on faulty memories; however, the likelihood of this happening is extremely low. According to the results of India's Census taken in 2001, 2,263,821 people, or 0.2 percent of the country's total population, have some form of mental impairment. Therefore, there is likely a sizable population of people with intellectual disabilities who also experience some form of visual impairment.

Ophthalmologists are at ease when examining infants and toddlers, but they may experience anxiety when confronted with a child who has intellectual disabilities. These children's minds are still those of infants, but their bodies are developing at a rate that is too rapid for their minds to keep up with. These children with special needs could have their visual status improved, which would be beneficial to their education and training. Ophthalmic evaluations on an annual basis, comparable to those performed in conventional schools, are mandatory for all cLDs.

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